GCSE

Impact of Technology

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Legislation and Computer Law

Key Areas:

- Data Protection (GDPR)
- Computer Misuse (CMA 1990)
- Intellectual Property (Copyright)
- AI and Autonomous Systems

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Objectives

- Understand how laws impact technology use.
- Examine major legislation: GDPR, Data Protection Act, Computer Misuse Act.
- Explore emerging issues: AI and autonomous systems.

Data Protection Overview

- **GDPR**: Governs the use of personal data.
- Protects individuals' rights over their data.
- Requires explicit consent for data use.
- Organizations face significant fines for non-compliance.

Six Principles of GDPR

1. Lawfulness, fairness, transparency.
2. Purpose limitation.
3. Data minimization.
4. Accuracy.
5. Storage limitation.
6. Integrity and confidentiality.

GDPR Rights

- **Data Subjects' Rights**:
  - Access to personal data.
  - Correct inaccuracies.
  - Erase data (Right to be forgotten).
  - Restrict processing.
  - Data portability.

GDPR Enforcement

- **Fines**: Up to 4% of global turnover.
- **Data Breach Notification**:
  - Must notify within 72 hours.
  - High-risk breaches require informing individuals.

Examples:

- Google fined £44m for ads breach (2019)
- British Airways fined £20m (2020)

Computer Misuse Act 1990

- Criminalizes unauthorized access to computer systems.
- **Offenses**:
    i. Unauthorized access.
    ii. Intent to commit further offenses.
    iii. Unauthorized modification of data.

Computer Misuse Act: Penalties

- Fines and imprisonment for offenders.
- Applies even if crime committed outside UK.

Key Cases:

- Unauthorized searches in police databases.
- Microsoft Hack (2017).

Emerging Issues: AI & Autonomous Systems

- Legal and ethical questions on:
  - **Liability** for AI decisions.
  - **Accountability** in autonomous systems.
  - Ongoing development of regulatory frameworks.

Summary: Key Legislation

- **GDPR**: Data protection and privacy.
- **CMA 1990**: Protects against unauthorized access.
- Rapidly evolving field as technology advances.

Ethical Issues

Key Areas:

- Ethics and moral principles.
- Data privacy and consent.
- Public safety and emerging technologies.
- Ethical implications of autonomous systems, hacking, and AI.

Objectives

- Define ethics in philosophy.
- Examine ethical principles in tech.
- Understand the impact of technology on privacy and safety.
- Discuss ethical issues in data privacy, cybersecurity, and public safety.

What is Ethics?

- **Ethics**: Branch of philosophy dealing with right and wrong.
- Guides moral behavior for individuals and societies.
- **Key Principles**:
  - Honesty, integrity, fairness, respect for others.

Technology and Ethics

- **Dynamic field**: Ethics evolves with societal changes and technology.
- **Tech impacts**:
  - Data privacy breaches.
  - Public safety concerns with AI, autonomous vehicles, etc.
- **Ethics vs Law**: Legal doesn't always mean ethical.

Ethical Issues: Data Privacy

- Unauthorized access to personal data.
- Consent and transparency in data collection.
- **Examples**:
  - Hacking healthcare records.
  - Apps accessing contact lists without permission.
  - Cloud data breaches exposing sensitive info.

High-Profile Cases:

- Facebook & Cambridge Analytica (2018).
- Equifax Data Breach (2017).

Ethical Issues: Public Safety

- **Tech impacts**:
  - Cyberattacks on infrastructure (e.g., power grids).
  - Hacking into transportation or medical systems.
  - Vulnerabilities in autonomous vehicles.

Examples:

- Uber self-driving car crash (2018).
- SolarWinds cyberattack (2020).

Ethics of Autonomous Vehicles

- **Ethical dilemma**:
  - Safety of passengers vs pedestrians.
  - Responsibility in accidents.
- **Concerns**:
  - Data tracking and privacy.
  - Autonomous decision-making in life-and-death situations.

Other Ethical Issues

- **Algorithmic Bias**:
  - AI decisions may perpetuate biases.
- **Digital Divide**:
  - Unequal access to technology creates disparities.
- **Disinformation**:
  - Digital platforms used to spread fake news.

Examples:

- Bias in facial recognition algorithms.
- Spread of false information influencing elections.

Summary: Key Ethical Issues in Tech

- Data privacy and unauthorized access.
- Public safety in autonomous systems and AI.
- Evolving ethical standards with new technology.

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Environmental Issues

Key Focus Areas:

- Environmental impacts of technology.
- Positive effects like renewable energy.
- Negative effects like e-waste and carbon emissions.
- Mitigation strategies by companies and governments.

Objectives

- Explain how technology and the environment are interconnected.
- Identify positive and negative environmental impacts of technology.
- Discuss the role of rare earth element extraction, e-waste, and carbon footprints.
- Evaluate efforts to mitigate these impacts.
- Encourage critical thinking on sustainability and tech.

Tech and the Environment

- **Resource Extraction**: Metals and plastics are required for tech production.
- **Energy Use**: Manufacturing, distributing, and using tech requires significant energy.
- **Balance**: We must balance technological progress with environmental sustainability.

Positive Environmental Impacts

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1. Renewable Energy Technologies

- Solar and wind energy advancements reduce reliance on fossil fuels.

2. Reduced Travel

- Online communication reduces travel, lowering pollution from transportation.

3. Climate Change Insights

- Computer simulations and modeling help monitor and address climate change.

4. Energy Efficiency

- Smart tech improves energy efficiency in buildings, industries, and transportation.

5. Environmental Monitoring

Precision Agriculture

- **IoT in Farming**:
  - Reduces waste and optimizes resource use.
  - Minimizes environmental impact through precision agriculture practices.

Negative Environmental Impacts

1. Electronic Waste (E-Waste)

- Rapid replacement of devices leads to growing e-waste.
- **Global E-waste Monitor 2020**: 53.6 million tonnes of e-waste were generated globally.

2. Resource Depletion

- Extracting rare earth elements for electronics damages ecosystems.
- Contributes to habitat destruction and pollution.

3. Carbon Footprint

- Production and transport of tech products increase CO2 emissions.
- **Example**: Amazon produced 16 million metric tons of CO2 in 2021.

4. Deforestation and Habitat Destruction

- Mining for electronic materials leads to land clearance, erosion, and habitat loss.
- Affects biodiversity and local ecosystems.

5. Water Pollution

- Toxic chemicals used in tech production (lead, mercury, cadmium) can pollute water supplies.

6. Energy Consumption in Data Centers

- Data centers require enormous energy to operate, contributing to global energy use.
- Estimates suggest data centers consume between 1-2% of global electricity demand.

Mitigation Strategies

1. **E-Waste Management**
   - Product design, reuse, recycling, and responsible disposal reduce e-waste.

2. **Renewable Energy**
   - Tech companies increasingly use renewable energy to power data centers and infrastructure.

3. **Energy-Efficient Tech**
   - Promoting hardware and software that reduces energy consumption.

4. Sustainable Sourcing

- Responsible mining and sustainable sourcing of raw materials.
- Ensuring that production processes minimize environmental damage.

5. Regulations and Standards

- Companies and governments are enforcing regulations to limit negative environmental impacts.

Balancing Progress with Sustainability

- The challenge: balancing the benefits of technological innovation with minimizing environmental damage.
- **Key Actions**:
  - Promote eco-friendly innovations.
  - Foster responsible consumption and disposal.
  - Prioritize sustainability in tech development.

Rise of AI

Tackling Long Form Questions

Key Focus Areas:

- Approach long-form questions like mini-essays.
- Include both sides of an argument.
- Use relevant keywords and examples.
- Address the ethical, legal, and environmental impacts of technology.

Objectives

- Understand the structure required for long-form answers.
- Use appropriate terminology and write clearly.
- Avoid spelling, punctuation, and grammar (SPAG) mistakes.
- Ensure the answer fully addresses the question with logical flow.

Structuring Your Answer

Key Considerations:

- **Prose form**: Write in continuous prose, not bullet points.
- **Use of keywords**: Make use of the correct terms from the course.
- **Relevance**: All points made must be directly related to the question.
- **Clarity**: Ensure that sentences follow logically, creating a coherent argument.

GCSE ...nical, Legal, and Environmental Impacts

For many questions, you can structure your answer around these three key areas:

1. **Ethical Impacts** (3 marks)
    - Consider ethical dilemmas: privacy, data misuse, job displacement.
    - How does the technology affect society's values?
2. **Legal Impacts** (3 marks)
    - Which laws are relevant? Data Protection Act, Copyrights Designs and Patents Act, Computer Misuse Act.
    - How does legislation impact the use or implementation of the technology?
3. **Environmental Impacts** (3 marks)
    - How does the technology affect the environment? E-waste, energy consumption, pollution.

OCR GCSE: Long-Form Question Format

- Worth **up to 8 marks**.
- To achieve full marks, you must:
  - Cover both sides of an argument.
  - Discuss positive and negative aspects.
  - Provide examples, even if general.

Key Points for Most Long-Form Answers

Examples to Include:

- **Record keeping**: How does the technology improve or complicate record-keeping?
- **Security and privacy**: Are there concerns with storing or handling sensitive data?
- **Job implications**: Will jobs be created or lost? How does the workforce change?
- **De-skilling**: Does the technology replace existing skills, e.g. GPS replacing map-reading?
- **De-personalisation**: Does technology make interactions less personal?

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Cultural, Legal, and Accessibility Considerations

Cultural Impact:

- Could the technology change traditions or expose people to new cultures?

Legal Considerations:

- **Data protection laws**: Ensure compliance with laws like the Data Protection Act.
- **Copyright issues**: Consider the legality of using certain materials (images, music, etc.).

Accessibility:

- Does the technology disadvantage specific groups, e.g. people with disabilities?
- Consider the **digital divide**: Is it affordable or accessible to all income groups?

Examples of Long-Form Question Considerations

- **Ethical**: Should AI be allowed to replace human jobs in sectors like healthcare or education?
- **Legal**: How does copyright law affect the sharing of media online?
- **Environmental**: How does data center energy consumption impact global emissions?

Addressing Both Sides of the Argument

- To get top marks, include **both positive and negative** impacts.
- For example:
  - **Positive**: Technology increases efficiency and reduces costs.
  - **Negative**: It could lead to job loss or data privacy concerns.

Democratic and Social Implications

- **Democratic Impact**: How does tech empower or disadvantage people in democracies?
    - Example: Social media allows people to share their views freely.
- **Government Regulation**: Consider how encrypted communications may impact democracy.
    - Some governments view encryption as a threat because it can be used by criminals.

Summary: Tips for Tackling Long-Form Questions

- Structure your answer around the **ethical**, **legal**, and **environmental** impacts.
- Use examples, even general ones, to support your argument.
- Address both sides of the issue.
- Ensure clear and coherent prose with no SPAG errors.